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AUTHOR Hopkins, Patricia; And Others
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ABSTRACT

In 1988-89, the Science Academy, a magnet program at LBJ High School (Austin, Texas), was awarded a two-year grant called Double TNT to "target new teachers" and "teach by novel techniques." The purposes of the program include: (1) interesting minority and female students in science; (2) attracting minority and female students to the teaching of science; (3) enriching the elementary science curriculum; (4) improving teaching skills in the sciences; and (5) increasing private sector involvement in the Science Academy and its activities. Major findings are presented in the areas of: (1) service to the district; (2) mini-mentorship for students; (3) Science Academy Summer Institute 1988; (4) recruitment challenges; (5) private sector involvement; and (6) video enrichment. (JD)

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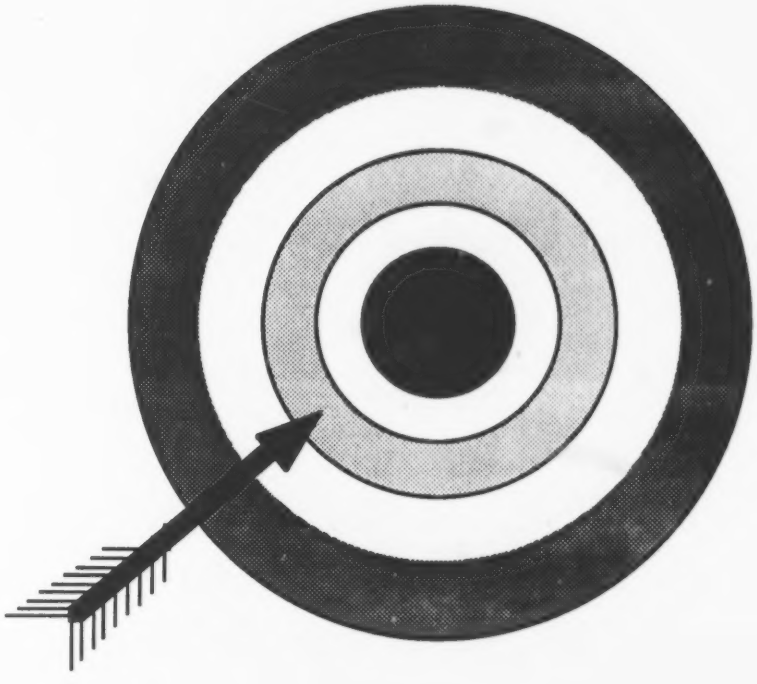
# Targeting New Teachers & Teaching by Novel Techniques

## Science Academy of Austin

Office of Research and Evaluation

Austin Independent School District



June, 1989

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# TARGETING NEW TEACHERS AND TEACHING BY NOVEL TECHNIQUES AT THE SCIENCE ACADEMY OF AUSTIN

## EXECUTIVE SUMMARY

**AUTHORS: Patricia Hopkins, Nancy Baenen, Roxane Smyer, Vicente Paredes**

## Program Description

In 1988-89, the Science Academy of Austin at LBJ High School was awarded a two-year grant from the National Science Foundation called Double TNT to "target new teachers" and "teach by novel techniques." The purposes of the program include:

- Interesting minority and female students in science;
- Attracting minority and female students to the teaching of science;
- Enriching the elementary science curriculum;
- Improving teaching skills in the sciences; and
- Increasing private sector involvement in the Science Academy and its activities.

## Major Findings

**SERVICE TO THE DISTRICT**: Science Academy eleventh and twelfth graders (122 of 200) taught science lessons developed during the summer to 146 third graders at Metz and Winn Elementary Schools. Third graders and teachers enjoyed the lessons. Students thought being a scientist or teacher sounded "fun." Third graders also taught their parents the lesson which was well received. Of the Science Academy students who taught, 19% reported increased interest in teaching as a result.

**MINI-MENTORSHIP**: Science Academy ninth graders (135 of 166) served as mentors to 109 Pearce and Metz sixth graders during two-hour science lessons. Sixth and ninth graders were enthusiastic about the experience; three of four (77% and 76%) thought it would be fun to be a scientist, mathematician, engineer, or computer scientist. One in three (31%) of the sixth graders indicated they would like to teach people. Of the Science Academy students, 12% were interested in teaching initially; 15% reported increased interest as a result of this experience.

**SCIENCE ACADEMY SUMMER INSTITUTE (SASI) 1988**: Two three-week sessions were held for 178 students. Nine innovative classes were offered. Teachers enjoyed the experience and indicated it would affect their future teaching. Nearly all (91%) of the students would like to return next summer.

**RECRUITMENT CHALLENGES**: Eighth graders (382) who did not quite meet Science Academy eligibility criteria as seventh graders were sent letters encouraging them to raise their achievement and apply to the Science Academy. In addition, 252 received personal motivating letters from individuals in government, business, and other professions. Overall, 72 of the 340 students (21%) were able to meet eligibility criteria. Ten of these applied and were accepted by the Science Academy; three were Black, none were Hispanic, and seven were Other. Thus, minority enrollment was not greatly impacted.

**PRIVATE SECTOR INVOLVEMENT**: Private sector involvement provided career counseling, equipment, field trip sites, motivating letters, curriculum development collaboration, and awards to students participating in various activities.

**VIDEO ENRICHMENT**: Five of eleven Service to the District and four of eight Mini-Mentorship lessons were videotaped as teaching tools for elementary teachers. The quality is not as professional as most teaching films, but they do serve to document interactions among students.

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**DISCLAIMER**

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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**Targeting New Teachers And Teaching by Novel Techniques at the Science Academy of Austin Final Report**

## PROGRAM DESCRIPTION: THE SCIENCE ACADEMY GRANT

### THE NATIONAL SCIENCE FOUNDATION GRANT TO THE SCIENCE ACADEMY

In September, 1987, a proposal from the Austin Independent School District (AISD) to "target new teachers and teach by novel techniques" in the District's Science Academy was submitted to the division of Private Sector Partnerships at the National Science Foundation (NSF). The Science Academy, a magnet program at Lyndon B. Johnson (LBJ) High School, has had a long-standing and beneficial relationship with Austin's academic and business community.

The amount of $338,000 for a two-year period was awarded to the Science Academy by the NSF in order to interest minority and female students in science and in teaching science, to enrich elementary science curriculum, and to improve teachers' skills in the sciences.

### COMPONENTS OF THE GRANT

The project components funded by the grant, designed for the 1988-89 and 1989-90 school years, included:

- Curriculum Collaboration between high school and elementary teachers in the summer for lessons to be used in the Service to the District component and by classroom teachers.
- Service to the District by each junior and senior in the Science Academy. Each was to teach a science enrichment lesson to a class of elementary students in high minority schools.
- Mini-Mentorship between Science Academy first-year students and sixth graders. The students were to be paired for two hours a day for one week in Biology or Physical Science. The freshman mentors were to learn the material and simultaneously teach their sixth grade partners.
- Video Enrichment, by videotaping of Curriculum Collaboration and Service to the District lessons. The videotapes would be catalogued and copied for use primarily by elementary teachers.

- Science Academy Summer Institute (SASI) for AISD teachers and students. After being trained in teaching innovative science or mathematics lessons, the teachers were to practice their skills in summer programs for students going into the seventh, eighth, and ninth grades.

- Recruitment Challenges, in the form of letters of encouragement, were to be sent to minority students whose standardized scores were near Science Academy entrance requirements.

- Private Sector Involvement was to continue to be sought to enhance effective teaching practices in all the grant components.

This paper is a report on the first year of the grant and its implementation at the Science Academy. In addition, context information on Science Academy student composition, achievement, and attrition has continued to be collected. A search of the literature exploring the background of the goals of the grant has been published separately (ORE Pub. No. 88.29).

## CURRICULUM COLLABORATION

### WHO COLLABORATED?

Two Science Academy science teachers and two elementary teachers collaborated in the summer of 1988 in a pilot project to produce an enhanced science curriculum. A professor from the University of Texas Department of Education consulted twice with the curriculum team. The curriculum was designed to support the Service to the District component by suggesting teaching resources for Science Academy students and elementary science teachers.

### WHO BENEFITED?

Twenty-nine lessons were designed for second and third graders in the District, to develop positive attitudes toward self and toward science. The book of lessons, Elementary/Secondary Science Curriculum Collaboration: Second and Third Grade Science Activities, by Halverson, Norris, Smith, and Waters, was published in June, 1988.

Some of the activities in the lesson plans are:

- Making a model of an airplane wing (Force);
- Answering "What lives in your refrigerator?" (Living World);
- Making rock candy (Rocks & Fossils); and
- Making electricity with wintergreen lifesavers (Magnetism & Electricity).

In addition to the third graders at Winn and Metz in the Service to the District project, these collaborative lessons were used in the 1988-89 school year at Highland Park, Kocurek, Oak Springs, Patton, and Williams Elementary Schools.

### USEFULNESS TO SCIENCE ACADEMY STUDENTS

Science Academy students involved in Service to the District liked the lesson plans. Of the 58 surveys returned, over half (57%) strongly agreed or agreed that the plans "made teaching easy." Twenty-four percent were neutral and 19% disagreed.

### USEFULNESS TO ELEMENTARY TEACHERS

Surveys were sent to the nine elementary teachers at Winn and Metz who participated in Service to the District. Five surveys were returned, all thought the lessons used (varying from 3-12 per teacher) were very effective. Teacher's comments indicated lessons were effective because they actively involved the students and included hands-on experience.

## SERVICE TO THE DISTRICT

Service to the District called for eleventh and twelfth graders at the Science Academy to teach science and mathematics to elementary students at high minority schools. Each lesson from the Curriculum Collaboration series of lessons, tied to the curriculum and District goals at that grade level. Each elementary student was asked to teach the lesson they learned to a parent. A University of Texas at Austin education professor provided training for the Science Academy students.

### PILOT SCHOOLS

Two schools were selected as pilot sites. Winn Elementary was an AISD Priority School, with a high minority enrollment. It was also the closest elementary school to LBJ High School, which made it convenient for transporting eleventh and twelfth graders to their teaching assignments. The principal of the second pilot school, Metz Elementary, approached the Science Academy and requested that Metz participate. It has a large number of Hispanic students.

### WHO SERVED? WHO WAS SERVED?

Science Academy eleventh and twelfth graders (122 of 200) in eight classes were involved in Service to the District in 1988-89. One class with twelve students taught several different times during the spring semester, mostly to different third graders at Metz and Winn. (Note: One group that did not participate was first-period Science Academy classes. These classes began at 7:50 a.m. and it was difficult to get to the elementary schools that early.)

In all, about 146 third graders at Metz and Winn, in nine classes, participated in these science lessons taught by Science Academy students. Five of the nine classes received more than one lesson. The remaining four classes were visited once.

### IMPACT ON THIRD GRADERS

Simple surveys on the third grade children's reactions to being taught by Science Academy students were administered to six classes. Four of the classes, 60 children total, completed and returned the surveys.

Overwhelmingly the third graders indicated that they liked studying mathematics and science, liked being taught by a high school student, and thought the lesson they were taught was interesting (the response rates were 56, 57, 59, and 59 out of 60, respectively). Nearly all the students (92%) indicated that

they thought it would be fun to be a scientist or to teach people.

THIRD GRADERS' INTEREST IN THE SCIENCE ACADEMY

Third grade interest in Science Academy was also high. The sixty students consisted of 34 Hispanic and 26 Black children. Of these students, 87% indicated that they would like to attend the Science Academy some day.

IMPACT ON SCIENCE ACADEMY STUDENTS

Fifty-eight of the eleventh and twelfth graders at the Science Academy returned surveys. These students were also positive about the experience and the Science Academy.

- 97% thought the lessons seemed to be fun for the younger students.
- 90% agreed or strongly agreed that they would encourage younger students to apply to Science Academy.
- 86% reported that they would consider a career in science, mathematics, or technology.
- 79% enjoyed the teaching experience.

The comments from the Science Academy students to the open-ended question "How would you improve this teaching experience?" had three areas of concern: that there should be fewer children to teach at a time, that they preferred to teach older children instead of third graders, and that they wished more time than the hour allowed could be spent with the children in the lesson.

INTEREST IN TEACHING

National Interest

After a long decline since the early '70's, interest in teaching as a college major and intended profession is on the rise on a national scale, according to a September 28, 1988 report in Education Week. Seven percent of those who took the Scholastic Aptitude Test (SAT) and 8% of those taking the American College Test (ACT) indicated that they planned to study education in college (Walsh).

Districtwide Interest

In the Districtwide Student Survey, 125 of 1,312 eleventh and twelfth graders surveyed (about 10%) indicated an interest in teaching as a career (23% were neutral or didn't know), and 5% (of 1,308 who responded) indicated an interest in teaching mathematics and science (Galindo & Baenen, 1989). Figure 1 shows the characteristics of the students interested in teaching as a career by sex and ethnicity.

FIGURE 1
**AISD 11TH AND 12TH GRADERS INTERESTED IN TEACHING**

Survey Question: I am interested in teaching as a career.

| | MALE N | % | FEMALE N | % | BLACK N | % | HISPANIC N | % | OTHER N | % | TOTAL N |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GRADE 11 | 27 | 44% | 35 | 56% | 8 | 13% | 12 | 19% | 42 | 68% | 62 |
| GRADE 12 | 23 | 37% | 40 | 63% | 10 | 16% | 14 | 22% | 39 | 62% | 63 |
| TOTAL | 50 | 40% | 75 | 60% | 18 | 14% | 26 | 21% | 81 | 65% | 125 |

Science Academy Interest

One fifth of Science Academy students (21%) reported that before their experience teaching third graders they had an interest or even a strong interest in teaching (see Figure 2). This is significantly higher than AISD eleventh and twelfth graders (10%) overall.

FIGURE 2
**SCIENCE ACADEMY 11TH AND 12TH GRADER'S INTEREST IN TEACHING BEFORE SERVICE TO THE DISTRICT**
**N=58**

Survey Question: Before this teaching experience, I had considered teaching as a career.

| | STRONGLY AGREE N | % | AGREE N | % | NEUTRAL N | % | STRONGLY DISAGREE N | % | DISAGREE N | % | TOTAL N |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GRADE 11 | 2 | | 5 | | 5 | | 13 | | 7 | | 32 |
| GRADE 12 | 1 | | 4 | | 3 | | 12 | | 6 | | 26 |
| TOTAL | 3 | 5% | 9 | 16% | 8 | 14% | 25 | 43% | 13 | 22% | 58 |

After their actual experience of teaching a lesson to third graders, 19% of the students reported more of an interest in teaching. The rest (81%) were neutral or reported no increased interest (see Figure 3).

FIGURE 3
**SCIENCE ACADEMY 11TH AND 12TH GRADER'S INTEREST IN TEACHING AFTER SERVICE TO THE DISTRICT**
**N=58**

Survey Question: After this teaching experience, I am more interested in teaching as a career.

| | STRONGLY AGREE N | % | AGREE N | % | NEUTRAL N | % | DISAGREE N | % | STRONGLY DISAGREE N | % | TOTAL N |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GRADE 11 | 2 | | 6 | | 10 | | 7 | | 7 | | 32 |
| GRADE 12 | 0 | | 3 | | 8 | | 11 | | 4 | | 26 |
| TOTAL | 2 | 3% | 9 | 16% | 18 | 31% | 18 | 31% | 11 | 19% | 58 |

A higher percentage (43%) believed that they would be successful teaching math or science after their teaching experience (see Figure 4).

FIGURE 4
**SCIENCE ACADEMY 11TH AND 12TH GRADERS BELIEFS ABOUT SUCCESS IN TEACHING MATH OR SCIENCE**
**N=58**

Survey Question: After this teaching experience, I believe I would be successful teaching math or science.

| | STRONGLY AGREE N | % | AGREE N | % | NEUTRAL N | % | DISAGREE N | % | STRONGLY DISAGREE N | % | TOTAL N |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GRADE 11 | 3 | | 9 | | 14 | | 2 | | 4 | | 32 |
| GRADE 12 | 4 | | 9 | | 7 | | 4 | | 2 | | 26 |
| TOTAL | 7 | 12% | 18 | 31% | 21 | 36% | 6 | 10% | 6 | 10% | 58 |

PARENT INVOLVEMENT

Six of nine third grade classes at Metz and Winn elementary schools returned parent surveys, available in English and Spanish. There were 175 surveys sent; 46 were sent twice. The parents were not identified on the forms and it is not possible to know if any of the 88 surveys returned (a response rate of 50%) were repeats or not. The surveys were tallied all together.

- 99% thought the lesson was interesting, and that their child did well.
- 98% indicated that their child had taught them the assigned science lesson and that the child seemed pleased after teaching it.
- 95% thought they would like more of these lessons.

Comments from parents about why they would like more lessons included:

- "Because it shows me that he is learning and it also makes him proud to be able to show me what he is doing."
- "[It] was very interesting for me and my child. He loved doing it, and I love watching him and know[ing] he is learning something like this."
- "I think it helps for children to know that we (adults) can learn from them."

EVALUATION BY ELEMENTARY TEACHERS

The nine elementary teachers at Winn and Metz were asked on end-of-the-year surveys to evaluate their experiences with Service to the District. Five surveys were returned; all responded positively to the science lessons taught by the Science Academy students and the third graders' response to them. Typical comments indicated that:

- "The high school students were very receptive to the elementary students. They encouraged them, shared information with them, and made it a valuable experience for them. The students were well prepared for the lessons."
- "It (teaching a lesson to their parents) stimulated their (third graders) eagerness to learn more, raised their self-esteem, and gave them a sense of achievement. Parents' responses were all quite positive."

Asked how the lesson by the Science Academy students could have been improved, teachers remarked that: 1) the high school students did not know the names of the third graders and that name tags would help, 2) the high school students might tell a little about themselves before the lesson in order to establish rapport with the younger children, and 3) visual aids in the lesson would have been useful.

None of the teachers who returned surveys nor their schools had received any private sector aid. When asked what kind of private sector involvement would be useful, most of the teachers answered that financial aid to purchase equipment such as microscopes, slides, test tubes, Bunsen burners and the like would be welcome. In addition, help for students with computer use and resource people coming to the classrooms were mentioned as possible

private sector involvement. (Note: NSF grant funds were used to purchase some science materials which will be available for checkout through the Science Materials Center next year.)

RECOGNITION OF STUDENTS' TEACHING

An Assistant to the Dean of the College of Education at the University of Texas at Austin awarded the students at the Science Academy certificates for their teaching of third graders, and spoke with them about teaching as a career. Each third grader who completed the assignment of taking a science activity home and teaching a parent also received a certificate for their teaching accomplishment.

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**MINI-MENTORSHIP**

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Science Academy ninth graders were paired in a mentor relationship with sixth graders from Metz Elementary and Pearce Middle School for two-hour science classes in biology or physical science. Over the course of three or four days, these student pairs were to share note-taking, field trips, labs, and tests. The sixth graders, it was hoped, would have older students, including minorities and young women, as role models, and the ninth graders would have an opportunity to teach in a hands-on atmosphere.

WHO SERVED? WHO WAS SERVED?

During the 1988-89 school year,approximately 135 of 166 ninth graders at the Science Academy participated in the Mini-Mentorship program. About 17 ninth graders participated twice, with different sixth graders to mentor each time. (First period classes at the Science Academy did not participate at all, as the 7:50 a.m. starting time was too early for the sixth graders to be able to arrive.) About 109 sixth graders at Pearce and Metz were involved in the program.

FIELD TRIPS

Sixth graders from Pearce Middle School and Science Academy mentors toured the Green Water Treatment Plant, Lake Long, Hornsby Bend Wastewater Treatment Facility, and Decker Power Plant.

IMPACT ON SIXTH GRADERS

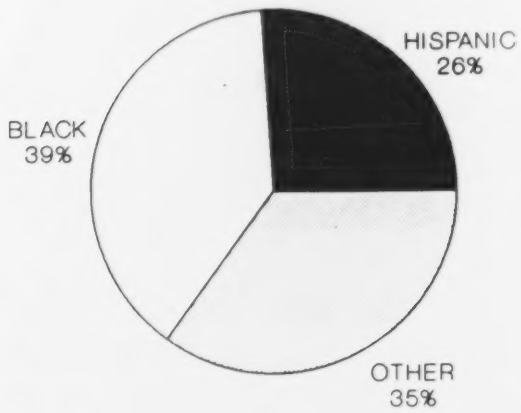
Surveys of sixth graders' reactions to being taught by Science Academy students were returned by three classes, or 77 children total (71% of those who participated). Most respondents

indicated that they liked studying mathematics and science (87% and 79%), liked being mentored by a high school student (99%), thought the lesson they were taught was interesting (94%), and did not think the lessons were too hard (77%).

Fifty-nine students (77%) thought it would be fun to be a scientist, mathematician, engineer or computer scientist. Overall, 41% indicated they would like to teach people with the majority (59%) indicating they would not. This is much higher than the interest of overall high schools which is 5% for the former and 12% for the latter.

The vast majority (81%) of sixth graders would like to attend Science Academy, with 19% (15 of 77) surveyed not interested (see Figure 5).

FIGURE 5
**ETHNICITY PERCENTAGE OF SIXTH GRADE STUDENTS WHO WOULD LIKE TO ATTEND SCIENCE ACADEMY**
**N=62**




IMPACT ON SCIENCE ACADEMY STUDENTS

Ninth grade students were generally enthusiastic about Science Academy's Mini-Mentorship program. Sixty-five percent of the 74 who returned surveys enjoyed the experience of being a mentor 28% were neutral. Almost all (97%) agreed or strongly agreed that they would encourage younger students interested in math or science to attend the Science Academy. Three out of four (76%) reported that they would consider a career in science, math, or technology, and most of the ninth graders (81%) thought the lessons seemed to be fun for the younger students.

Comments from the Science Academy students on how to improve the teaching experience reflected several areas of concern: spending more time with the younger students, having smaller classes or more one-on-one teaching, and choosing seventh or eighth graders instead of sixth graders or having some kind of selection criteria for their participating in the program.

SCIENCE ACADEMY STUDENTS' INTEREST IN TEACHING

In the Districtwide Student Surveys in AISD from fall, 1988, only 59 (or 5%) of 1,107 ninth graders indicated they were interested in teaching as a career. A slightly larger number, 6%, said they were interested in teaching mathematics and science (Galindo and Baenen, 1989).

Some ninth-grade Science Academy students (9 of 74 or 12%), in their Mini-Mentorship surveys, said they had given some previous thought to teaching as a career. Compared to the 5% of ninth graders in the Districtwide Student Surveys who indicated an interest in teaching, Science Academy students indicated a significantly higher interest. The percentage of those who replied that they had become more interested in teaching because of their Mini-Mentorship experience was 15%. The final teaching question on the survey, "After this mentoring experience, I believe I would be successful teaching math or science," was answered "Strongly Agree" or "Agree" by 34% of the students.

RECOGNITION OF STUDENTS' TEACHING

Science Academy ninth graders who participated in Mini-Mentorship were awarded certificates of achievement by a representative of the College of Education at The University of Texas at Austin. A discussion on teaching as a possible career followed the awards.

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## VIDEO ENRICHMENT

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1988-89 was designed to be the pilot year for the video enrichment component of the NSF grant. It was intended that lessons to third graders taught by senior Science Academy students be videotaped for eventual use in teaching by elementary teachers. In the second year, it was proposed that these videotapes be catalogued according to topic and page number of the text in use in the elementary classroom for easy retrieval by teachers. Not only would these videotapes provide easily accessible resources for enriching the elementary science curriculum, it was hoped, but they would also furnish a repeatable record of high school students serving as role models for smaller children.

RESULTS OF THE PILOT YEAR

The Director reported that the results of the pilot year were not what had been wished, but proved instructive.

Five of the 11 lessons that took place in the Service to the District program were videotaped. For the Mini-Mentorship program, four of the eight lessons were videotaped. In the end, the results were not useful as "teaching tools" and could not match the professional quality of typical teaching films. However, the videotapes were excellent as documentation of the program.

The Director reported that the positive interaction between the older Science Academy students and the younger students being taught or mentored came across in the videotapes very well, showing especially the elementary students responding with enthusiasm to being taught by high school students. The videotapes also captured how the teachers became involved in the lessons, and illustrated the way both programs attempted to teach science by hands-on techniques.

RECOMMENDATIONS FOR THE SECOND YEAR OF THE GRANT

The basic recommendation for the second year of the grant was that ambitious plans for producing videotapes for teaching be discarded. The production of videos for documentation, as presented in the grant proposal, will be continued in 1989-90.

The documentary videotapes would be available on request, particularly as the Service to the District and Mini-Mentorship programs expand into other schools and principals and teacher raise questions about their effectiveness.

## SCIENCE ACADEMY SUMMER INSTITUTE

The Science Academy also offered a summer program for students who had completed the sixth, seventh, or eighth grades. Each student was required to fill out an application and get two letters of recommendation from teachers. The purpose was to offer fun and challenging science courses to these students. The Science Academy Summer Institute (SASI), in the summer of 1988, consisted of two three-week sessions, with 108 students attending the first session and 70 students the second session. Of those enrolled 47 (26%) were entering seventh graders, 32 (18%) were entering eighth graders, and 98 (55%) were entering ninth graders. A balanced number of males and females participated, with 31% minority students (see Figure 6).

FIGURE 6
**1988 SASI STUDENTS**

| | Black | Hispanic | Other | TOTAL |
|---|---|---|---|---|
| Male | 14 (39%) | 11 (65%) | 62 (53%) | 87 (51%) |
| Female | 22 (61%) | 6 (35%) | 56 (47%) | 84 (49%) |
| TOTAL | 36 (21%) | 17 (10%) | 118 (69%) | 171 (100%) |

Frequency missing = 7

THE COURSES

The nine courses in each session of the Institute were:

- ELECTRONIC SURGERY, on circuitry and how appliances work;
- FORENSIC SCIENCE;
- DISCOVERING DATABASES;
- PHYSICS CIRCUS;
- INTRODUCTION TO REFERENCE, on using research tools including databases;
- COOKBOOK CHEMISTRY, on chemical reactions of food;
- NUMBER GAMES;
- ODDS ON WINNING, on the strategies and statistics of card playing; and
- COMPUTER GRAPHICS.

Each instructor was responsible for putting a four-hour science lesson together. The lesson was taught in two-hour sessions. Each student completed nine lessons during the summer program. Three field trips were also scheduled, to Balcones Research Lab to tour its facilities for electromechanics, economic geology, and archeology, to Onion Creek to research fire ants, and to Lake Long to explore its ecology. At the end of each session a Murder Mystery was enacted as an applied project. Using the skills in classes just completed, students pursued clues to solve the murder presented to them.

THE TEACHERS

Ten teachers were involved in teaching the nine SASI courses. One was a one-week substitute. The teachers included an assistant principal at an elementary school, four middle school teachers (two sixth-grade teachers and two science teachers), and five high school professionals, (two mathematics teachers, two science teachers, and one high school librarian). Six of the SASI instructors were female.

## EFFECTIVENESS

The Science Academy staff developed two surveys to evaluate teacher and student impressions of SASI. Each was composed of open-ended questions.

### Teacher Evaluations

All ten of the SASI teachers completed a survey. All were positive, with some program aspects mentioned repeatedly.

- Seven teachers mentioned the low-stress, low-pressure aspects of the program.
- Five addressed the novel approaches and creative opportunities in teaching.
- Four of the teachers saw the classes as a chance for more students to have enjoyable contact with science.
- Three commented that they enjoyed working with the students and other faculty members.
- Two mentioned that the classes were challenging without being difficult and gave students an opportunity to work as a group.

The teachers also plan to take aspects of SASI into their fall classrooms. Five said they would use more novel, hands-on teaching methods in their classes and four said the program boosted their morale.

SASI instructors were also asked what advice they would give incoming instructors. Being flexible, spontaneous, and creative all received three or more endorsements. Nine of the ten teachers would like to teach at SASI again, and all ten would recommend the program as a good summer job. All also agreed that the teachers in the Institute received administrative support.

The instructors also suggested a few changes. Five commented that a screening method for students was needed. They said that too many students were apathetic, there for the wrong reasons, or because their parents made them. Three teachers said more time before the sessions to prepare and get to know the other faculty, would be beneficial. Three felt no changes were needed.

### Student Evaluations

The 70 students enrolled in the second session of SASI were surveyed, with 57 surveys returned, a response rate of 81%. Students believed the most interesting class was clearly Electronic Surgery (see Figure 7). It also ranked highest as "most fun" and "taught you the most". Computer Graphics, with nine endorsements, was rated "most difficult."

FIGURE 7
**1988 SASI CLASS RATINGS**

Survey Items: Which of the courses was (were) the:
most interesting?
most fun?
most difficult?
Which one of the courses taught you the most?

| | NUMBER OF ENDORSEMENTS* | CLASS NAME |
|---|---|---|
| MOST INTERESTING | 41 | Electronic Surgery |
| | 16 | Cookbook Chemistry |
| | 12 | Physics Circus |
| MOST FUN | 41 | Electronic Surgery |
| | 14 | Cookbook Chemistry |
| | 14 | Odds on Winning |
| | 14 | Number Games |
| MOST DIFFICULT | 9 | Computer Graphics |
| | 8 | Number Games |
| | 7 | Discovering Databases |
| TAUGHT YOU THE MOST | 30 | Electronic Surgery |
| | 12 | Physics Circus |
| | 6 | Discovering Databases |

* Many students endorsed more than one course

Students were also asked to suggest additions to the SASI curriculum. Science-related suggestions that were mentioned more than once were Astronomy, with three endorsements, and Robotics, with two. When asked about the length of the program, thirty of the students (53%) preferred the three week sessions, 22 (39%) voted for six-week sessions, and five (8%) indicated other preferences, from one day to nine weeks.

Nearly all of the students (91%) indicated they would like to return the following summer, with only two saying no and two saying maybe. Most (79%) said they would recommend SASI to their friends, eight (14%) checked maybe, three (5%) marked no, and there was one non-response. Two out of three (67%) indicated that they would like to attend Science Academy, 14 (25%) said maybe, and four (7%) said no.

## RECRUITMENT CHALLENGES

Along with teacher recommendations, scores from the Iowa Tests of Basic Skills (ITBS) are the principal means of determining eligibility to the Science Academy for entering ninth graders. The pool of eligible students based on test scores is fairly large from year to year, but eighth grade students who scored just below acceptable levels the year before constitute a major recruiting source as well (see Figure 8). Recruitment Challenges is a concerted letter-writing effort to encourage those students whose seventh grade ITBS scores were below standard to strive to meet testing requirements for the Science Academy in the eighth grade. In 1988-89 there were 166 entering ninth graders. In 1989-90, the Science Academy hopes to have a freshman class of 200.

FIGURE 8
**POOL OF POSSIBLE APPLICANTS TO THE SCIENCE ACADEMY BASED ON ITBS SPRING 1988 PERCENTILE SCORES FOR SEVENTH GRADERS**

| Category | Number |
|---|---|
| **ELIGIBLE STUDENTS**<br>(Combined reading + mathematics = 140th %ile, mathematics subtest = 60th+ %ile, other subtests = 50th+ %ile) | **1,018 (28%)** |
| **JUST MISSED**<br>(Combined scores = 140th+ %ile, mathematics subtest less than 60th %ile) | **114 ( 3%)** |
| **TARGET GROUP**<br>(Combined scores = 110-139th %ile, subtests 50th+ %ile) | **382 (11%)** |
| **POSSIBLES**<br>(Combined scores = 110-139th %ile, less than 50th %ile on subtests) | **270 ( 7%)** |
| **NOT LIKELY**<br>(Combined scores = less than 110th %ile) | **1,853 (51%)** |
| **TOTAL** | **3,637 (100%)** |

## ELIGIBLE STUDENTS

Of the 3,637 eighth graders in the school year 1988-89 with ITBS scores on file from the previous year, 1,018 met eligibility standards of combined reading and mathematics percentile scores of 140 or more, a mathematics ranking of at least 60th percentile, and subtests of 50th percentile or higher. A letter of invitation from the Science Academy was sent to each of these eligible students in the fall.

The pool of eligible minority students was proportionately small; only 7% of the eligible eighth graders were Black (20% of all eighth grade students in the District in 1988-89 were Black), with only 16% Hispanic (33% of District eighth graders were Hispanic). Overall 232 minority students qualified (see Figure 9). The proportion of male students to female students was similar for the District (51% male, 49% female) and for eligible eighth graders (Student Records Fall Survey Report, fall, 1988).

FIGURE 9
**ELIGIBLE EIGHTH GRADERS**

| | Black | Hispanic | Other | TOTAL |
|---|---|---|---|---|
| Male | 30 (42%) | 82 (51%) | 370 (47%) | 482 (47%) |
| Female | 41 (58%) | 79 (49%) | 416 (53%) | 536 (53%) |
| TOTAL | 71 ( 7%) | 161 (16%) | 786 (77%) | 1018 (100%) |

## TARGETED STUDENTS

The target group for Recruitment Challenges was those eighth graders whose seventh grade scores were between 110-139 on the combined subjects and at least 50 on all subtests. This group was composed of 382 students (see Figure 10).

FIGURE 10
**RECRUITMENT TARGET GROUP**

| | Black | Hispanic | Other | TOTAL |
|---|---|---|---|---|
| Male | 22 (41%) | 41 (41%) | 103 (45%) | 166 (43%) |
| Female | 32 (59%) | 60 (59%) | 124 (55%) | 216 (57%) |
| TOTAL | 54 (14%) | 101 (26%) | 227 (59%) | 382 (100%) |

The target group came closer than the group of eligible students to resembling the ethnic distribution of students in the District. Among the eligible eighth graders, 23% were minority, whereas 40% of the target group was minority. According to the Achievement Profiles for 1987-88, the median ITBS scores for minority seventh grade students were considerably lower than for Other students. The median Reading Total score for Black seventh graders, for instance, was 35, for Hispanics, 41, and for Others, 69. The median Mathematics Total score for Black seventh graders was 36, for Hispanics, 44, and for Others, 70. This disparity in achievement scores limits the number of minority students eligible to attend the Science Academy and to be targeted for special recruitment efforts.

Eighth grade students in the target group were sent letters of encouragement from the Science Academy, asking if they would like to receive additional letters from local leaders. All those who returned a request form (17% of the target group), and all Hispanic students, were then sent motivating letters written by private sector individuals. As of the end of February, 1989, 252 of these letters had been mailed.

## ACHIEVEMENT RESULTS

More than one in five Target Group students were able to raise their scores and meet higher admissions criteria. Of 340 target group students for which data was available, 72 (21%) were able to meet the Eligible Students group criteria, and eight (2%) were able to meet the Just Missed group criteria.

## STUDENT RESPONSE

From the Target Group of 382, 25 students (7%) eventually applied to the Science Academy; ten were Black (40%), five were Hispanic (20%), and ten were Other (40%). Of these students ten were able to raise their ITBS scores and were accepted into the Science Academy; three were Black (30%), none were Hispanic, and seven were Other (70%). Fifteen students were not able to meet eligibility requirements.

## RECRUITMENT CHALLENGE IMPLICATIONS

The recruitment challenge efforts appeared to have mixed results. Over 250 personalized letters were sent by prominent private sector members. Twenty percent of the Target Group (72 students) were able to meet eligibility criteria (of course, it is not known whether other factors besides the Science Academy efforts played a part in their improved achievement). On the other hand, only 10 of the 72 applied and were accepted to the Science Academy. None of these students were Hispanic, a prime target for increased enrollment. Fifteen others showed an interest by applying, but did not meet eligibility criteria. The overall pay off therefore appears small as a recruitment effort.

There may be more effective ways to increase minority enrollment at the Science Academy. For example, 232 minority seventh graders met eligibility criteria. Given a total freshman class of 200, successful recruitment among this group could obviously have a vast impact on ethnic percentages of those enrolled. These students could be encouraged to maintain their excellent scores and apply through letters, telephone calls, presentations on careers, personal visits, or other efforts. Also, the "Just Missed" group of 114 students includes more promising prospects than this year's Target Group (see Figure 8).

## PRIVATE SECTOR INVOLVEMENT IN THE SCIENCE ACADEMY

Private sector involvement in the Science Academy has been prevalent from its beginning in 1983, when IBM originated the idea of a mathematics and science high school in the Austin Independent School District. Through the Advisory Board and its activities on behalf of the Science Academy, students become aware of technological advances, receive career counseling, and are given the use of excellent, up-to-date equipment.

Through the auspices of the NSF grant, private sector involvement enhanced the Science Academy's ability to model effective science teaching practices. Since effective science teaching involves making the material of a science lesson relevant to students, field trips to wastewater plants or to study fire ants, for example, became "real world" applications for what was learned in the classroom or in the laboratory.

### ADVISORY BOARD

Twenty-three professional and business people continue to serve on the Science Academy Advisory Board (see Figure 11). They meet monthly or bimonthly with the Science Academy administrative staff, the Executive Director of the Department of Management Information for AISD, and the Superintendent of the District. The Board advises on policy, places students in internships and in summer employment in local companies, arranges for field trips and the donation of equipment, provides speakers to Science Academy classes, serves as technical advisors for curriculum development and other needs of the Science Academy, and funds staff retreats in the summer.

Figure 11
**ALPHABETICAL LIST OF ADVISORY BOARD**

VAUGHN ALDRIDGE
Regional Director, AT&T

J. CARLIN BRANDT
Division Manager,
Southwestern Bell Telephone

GERALD BRINEY
Program Manager, IBM

JERRY CARLSON
Vice President, IBM

HECTOR DELEON
Attorney,
DeLeon, Boggins, and Richards

DR. JOHN ELLIS
Superintendent, AISD

DR. BILL ESPEY, JR.
President,
Espey Huston & Assoc.UT

S.A. GARZA
President
S.A. Garza Engineers

BOB HARENSKY
Chief Operating Officer,
Seton Medical Center

JERRY LEEDY
Plant Manager,
Abbott Laboratories

DR. GLYNN LIGON
Executive Director DMI
AISD

WALT LILL
Director of Personnel, Motorola

BOB MOESER
Sr. Vice President,
Arnold Menn & Assoc.

DR. DELBERT OTTMERS
Vice President, Radian

BOB RUTISHAUSER
Vice President, MCC

MURRAY SHAW
Vice President, Tracor

RON SHELLY
Executive Vice President,
Texas Instruments

SYLVIA SIMPSON
Public Relations Manager,
Lockheed

PETE SUAREZ
Special Asst. to the Dean
College of Ed., UT

DR. ROOSEVELT TAYLOR JR.
Obstetrics and Gynecology
Private Medical Practice

DR. BRUCE A. TORP
Technical Director, 3M

DR. CHARLES WARLICK
Dir., Computation Center
Univ. of Texas System

ERNEST YEAKEY
Laboratory Director,
Texaco Research Labs

CURRICULUM COLLABORATION

Dr. James Barufaldi, professor of education and Director of the Science Education Center at the University of Texas at Austin, consulted twice during the summer with the curriculum team of two elementary and two Science Academy teachers.

SERVICE TO THE DISTRICT

Before they taught third graders at Winn or Metz Elementary Schools, Service to the District participants from the Science Academy were trained by Dr. Barufaldi of UT. Pete Suarez, Special Assistant to the Dean of the College of Education at the University of Texas at Austin spoke to the Science Academy students about teaching as a career, and awarded certificates to those who had taken part.

MINI-MENTORSHIP

Mr. Suarez, awarded Science Academy ninth graders with certificates for their skill in mentoring sixth graders visiting during the year. He spoke to the Science Academy students about teaching as a career, and encouraged the ninth graders to consider teaching in their future professional plans.

Contacts for field trips during the Mini-Mentorship program included several City of Austin employees. Jerry Eshberger, Superintendent of the Austin Green Water Treatment Plant, and Chester Pierce, Supervisor of Plant Operations, gave a tour in February to Science Academy students and sixth graders from Pearce Middle School. A similar tour of Lake Long was given to Pearce and Science Academy students by Bunny Bennett, Parks Manager. Phil Tamez, Assistant Superintendent at Hornsby Bend Wastewater Treatment Facility, and Tony Shiekhi, Engineering Associate at Decker Power Plant, hosted students at their facilities.

SCIENCE ACADEMY SUMMER INSTITUTE

SASI students visited three sites at the Balcones Research Laboratory in the summer of 1988: the facilities for electromechanics, economic geology, and state archeology. Contact persons were Angie Bowls, Administrative Associate for the Electromechanics Center, Steve Stubbs, Assistant Program Coordinator of the Bureau of Economic Geology, and Carolyn Spock, Head of Records Division, the Texas Archaeological Laboratory.

Other field trips were to Lake Long, hosted by Austin Parks Manager Bunny Bennett, to Onion Creek to research fire ants, arranged by Lea Stone, Nature Preserves Manager of the City of Austin, and to the Department of Public Safety (DPS) headquarters in north Austin. Public Information Officer David Wells of the DPS gave Summer Institute students a tour of the shooting gallery, administrative offices, and forensic labs used by the state police.

RECRUITMENT CHALLENGES

Challenge letters to targeted students were written by 20 business leaders, government officers, and professionals, and by

five Science Academy teachers (four of them women) (see Figures 12 and 13). Each writer sent approximately ten letters to eighth grade students whose seventh grade ITBS scores were just short of eligibility for the Science Academy, encouraging them to bring up their scores on the next series of tests.

In addition to sending letters, several private sector individuals encouraged specific types of students to apply to the Science Academy. S.A. Garza, for instance, President of Garza Engineers, sent his letters to Hispanic students in particular, and followed through with personal telephone calls to the students he had written.

FIGURE 12
**RECRUITMENT CHALLENGERS**

| PRIVATE SECTOR | NUMBER |
|---|---|
| GOVERNMENT | 4 |
| BUSINESS | 9 |
| UNIVERSITY | 4 |
| PROFESSIONAL | 3 |
| TOTAL | 20 |

FIGURE 13
**ALPHABETICAL LIST OF RECRUITMENT CHALLENGERS**

GONZALO BARRIENTOS (G)*
Senator,
Texas State Senate

GERALD BRINEY (B)
Program Manager, IBM

JERRY CARLSON (B)
Vice President, IBM

WILLIAM CUNNINGHAM (U)
President, UT Austin

HECTOR DELEON (P)
Attorney,
DeLeon, Boggins,& Richards

S.A. GARZA (P)
President,
S.A. Garza Engineers

PHIL GRAMM (G)
Senator,
U.S. Senate

MARY HOUSTON (B)
Programmer, IBM

MIKE LADEN (B)
Vice President,
Lockheed

JERRY LEEDY (B)
Plant Manager,
Abbott Laboratories

JUDY MAGGIO (P)
News Anchorperson,
KVUE-TV, Austin

HANS MARK (U)
Chancellor,
U.T. Austin

GARRY MAURO (G)
Land Commissioner,
Texas General Land Office

GEORGE H. MORE III (B)
President,
George More Investments

DAVID PENROSE (B)
Director of Special Programs,
Lockheed

J. J. PICKLE (G)
Representative,
U.S. Congress

JURGEN SCHMANDT (U)
Director,
Center for Growth Studies, U.T.

SYLVIA SIMPSON (B)
Public Relations Manager,
Lockheed

PETE SUAREZ (U)
Special Asst. to the Dean,
College of Ed., U.T. Austin

SAM J. ZIGROSSI (B)
Manager, IBM

*G=Government B=Business
U=University P=Professional

## NATIONAL CONTEXT: RESULTS OF A LITERATURE SEARCH

A search of published literature was undertaken to explore the background of the goals of the National Science Foundation grant to the Science Academy in 1988-89. The goals of the grant included:

- To interest minorities and young women in science and in teaching; and
- To improve precollegiate science teaching through a continued partnership with local business.

Five questions exploring these goals were asked in the literature review. The full report on the findings, with citations, has been published separately as Women, Minorities, and the Private Sector in Science and Mathematics Education: A Review of the Literature, by Patricia Hopkins (ORE Pub. No. 88.29). The questions and their findings are summarized here.

Are minorities being attracted to teaching as a career?

The number of Blacks and Hispanics majoring in education has fallen dramatically in recent years. The number of bachelor's degrees in education received by Blacks declined by 52% from 1976 to 1983, and for Hispanics, by 11% during the same period. Minorities trying to enter teaching are failing state teacher competency tests by large percentages. In Texas, for instance, 61% of Blacks and 50% of Hispanics failed the Pre-Professional Skills Test (P-PST) in 1987. Such high failure rates discourage entrance into the profession. Attrition for minorities in education is also high, from teachers leaving teaching and from teachers approaching retirement age.

What factors are at work in the mathematics and science teacher shortage?

Low starting salaries for teachers, job monotony, lack of job security, low maximum salaries, poor job availability, and discouragement or nonencouragement from teaching by family, counselors, and friends are factors in the shortage. While there is some indication of rising interest among college students in teaching as a career, the number of prospective teachers is still far short of the demand. Training of mid-career professionals in other fields for the teaching of mathematics and science is an alternative being tried in several programs around the country.

What is known about sex-role models for women in science?

Fewer than 9% of scientists and engineers are women; less than a quarter of science teachers at grades 10-12 are female, although women predominate in the lower grades. Gender, not achievement, may be the strongest predictor of science career preferences. Some studies have shown peer influences and differential treatment by teachers in the classroom to be factors influencing women not to enter scientific fields. Formal sex role modeling in the regular classroom, on the other hand, has been seen to affect students' attitudes and career interest positively.

Are there other secondary school programs promoting teaching as a career?

The Science Academy's proposal of having juniors and seniors teach third graders and high school freshmen mentor sixth graders is unusual. Two other programs in other cities show some similarity: the Educators 2000 Project in New Orleans, which recruits middle school minority students into teaching, and the High School for the Teaching Professions in Houston, a magnet school to develop college-bound students for careers in education.

How has business allied itself with precollegiate science education elsewhere?

Executives on loan to schools, adopt-a-school programs with particular schools, cooperative education programs or student or teacher internships, contributions of equipment and facilities, and summer employment for students and teachers are some of the ways businesses have established partnerships with science education in schools around the country.

## CHARACTERISTICS OF SCIENCE ACADEMY TEACHERS AND STUDENTS

### TEACHERS

Almost half (47%) of the Science Academy's 19 teachers in the 1988-89 school year were female. About 10% of the faculty was minority. That is, nine of 19 teachers were women, one male teacher was Hispanic, and one male teacher was Black.

For the District, 55% of high school science, mathematics, and computer science teachers in 1988-89 were female, and 21% were minority. This gender ratio of AISD compares very favorably with national figures reported by Donovan, Fronk, & Horton in 1984 where 24% of science teachers at grades 10-12 were female.

STUDENTS: ETHNICITY

Ethnicity for all grades at the Science Academy in 1988-89 was 18% Black, 11% Hispanic, and 71% Other. Ethnicity for the District this year at the High School grades only was Black, 21%; Hispanic, 28%; and Other, 51% (AISD, Ethnic composition of students, 1988.) Black enrollment in the Science Academy fell slightly short of the District percentage. The greater disparity in minority distribution of students was in the percentage of Hispanic students enrolled, less than half that for the District as a whole.

As can be seen in Figure 14, ethnicity in the Science Academy has been fairly stable over the last three years, with a decline in Black enrollment after the first year, 1985-86, and an increase in Hispanic enrollment the second year, in 1986-87.

STUDENTS: GENDER

For all students at all grade levels in the Science Academy, the sexes were not quite evenly divided: 43% were female, 57% were male. For grades 9-12 throughout the District, the percentage of females to males was slightly closer: 49% female to 51% male. The smaller percentage of young women, like the small number of Hispanics, reflects the challenges faced in recruiting students to the Science Academy. The gains made by female students, however, have been substantial (see Figure 15).

FIGURE 14
**ETHNICITY OF SCIENCE ACADEMY STUDENTS**

| YEAR/ GRADE | BLACK N (%) | HISPANIC N (%) | OTHER N (%) | TOTAL N (%) |
|---|---|---|---|---|
| **1985-86** | | | | |
| 9 | N/A | N/A | N/A | 115 ( 68%) |
| 10 | N/A | N/A | N/A | 41 ( 24%) |
| 11 | N/A | N/A | N/A | 12 ( 7%) |
| 12 | N/A | N/A | N/A | 0 ( 0%) |
| TOTAL | 33 (20%) | 12 ( 7%) | 123 (73%) | 168 (100%) |
| **1986-87** | | | | |
| 9 | 20 (43%) | 11 (44%) | 94 (49%) | 125 ( 48%) |
| 10 | 15 (32%) | 11 (44%) | 73 (38%) | 99 ( 38%) |
| 11 | 11 (23%) | 3 (12%) | 20 (10%) | 34 ( 13%) |
| 12 | 1 ( 2%) | 0 ( 0%) | 4 ( 2%) | 5 ( 2%) |
| TOTAL | 47 (18%) | 25 (10%) | 191 (73%) | 263 (100%) |
| **1987-88** | | | | |
| 9 | 31 (47%) | 21 (50%) | 100 (36%) | 152 ( 39%) |
| 10 | 16 (24%) | 9 (21%) | 79 (28%) | 104 ( 27%) |
| 11 | 12 (18%) | 9 (21%) | 78 (28%) | 99 ( 26%) |
| 12 | 7 (11%) | 3 ( 7%) | 22 ( 8%) | 32 ( 8%) |
| TOTAL | 66 (17%) | 42 (11%) | 279 (72%) | 387 (100%) |
| **1988-89** | | | | |
| 9 | 32 (34%) | 16 (29%) | 118 (32%) | 166 ( 32%) |
| 10 | 32 (34%) | 20 (36%) | 91 (25%) | 143 ( 28%) |
| 11 | 17 (18%) | 10 (18%) | 79 (22%) | 106 ( 21%) |
| 12 | 13 (14%) | 10 (18%) | 76 (21%) | 99 ( 19%) |
| TOTAL | 94 (18%) | 56 (11%) | 364 (71%) | 514 (100%) |

FIGURE 15
**GENDER OF SCIENCE ACADEMY STUDENTS**

| YEAR/ GRADE | MALE N (%) | FEMALE N (%) | TOTAL N (%) |
|---|---|---|---|
| **1985-86** | | | |
| 9 | N/A | N/A | 115 ( 68%) |
| 10 | N/A | N/A | 41 ( 24%) |
| 11 | N/A | N/A | 12 ( 7%) |
| 12 | N/A | N/A | 0 ( 0%) |
| TOTAL | 122 (73%) | 46 (27%) | 168 (100%) |
| **1986-87** | | | |
| 9 | 76 (44%) | 49 (55%) | 125 ( 48%) |
| 10 | 69 (40%) | 30 (34%) | 99 ( 38%) |
| 11 | 26 (15%) | 8 ( 9%) | 34 ( 13%) |
| 12 | 3 ( 2%) | 2 ( 2%) | 5 ( 2%) |
| TOTAL | 174 (66%) | 89 (34%) | 263 (100%) |
| **1987-8** | | | |
| 9 | 75 (32%) | 77 (49%) | 152 ( 39%) |
| 10 | 62 (27%) | 42 (27%) | 104 ( 27%) |
| 11 | 71 (31%) | 28 (18%) | 99 ( 26%) |
| 12 | 23 (10%) | 9 ( 6%) | 32 ( 8%) |
| TOTAL | 231 (60%) | 156 (40%) | 387 (100%) |
| **1988-89** | | | |
| 9 | 88 (30%) | 78 (35%) | 166 ( 32%) |
| 10 | 71 (24%) | 72 (33%) | 143 ( 28%) |
| 11 | 63 (21%) | 43 (20%) | 106 ( 21%) |
| 12 | 72 (24%) | 27 (12%) | 99 ( 19%) |
| TOTAL | 294 (57%) | 220 (43%) | 514 (100%) |

## SCIENCE ACADEMY ACHIEVEMENT

Figure 16 shows the results of the ROSE regression analyses for the Science Academy students in comparison to high-achieving students Districtwide. The mean grade equivalent scores for the ITBS are shown for each grade level for 1988 and for 1989. The predicted 1989 score is based upon students in the District with similar 1988 test scores and characteristics. The advantage is an indication of how well Science Academy students exceeded expected Districtwide gains of high-achieving students.

Science Academy students exceeded predicted gains in nine of twelve comparisons in reading, mathematics, and science. Gains at predicted levels were made in the other three comparisons. Science Academy ninth and tenth graders showed the most advantage over their AISD peers, with gains above predicted levels in all areas. Gains exceeded predictions at all grade levels in science.

FIGURE 16
**GRADE EQUIVALENT GAINS OF SCIENCE ACADEMY STUDENTS COMPARED TO DISTRICTWIDE EXPECTED GAINS FOR HIGH ACHIEVING STUDENTS - ROSE ANALYSIS**

| | READING COMPREHENSION | | | | MATHEMATICS | | | | SCIENCE | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sp 88 | Sp 89 | Pred 89* | Advantage | Sp 88 | Sp 89 | Pred 89* | Advantage | Sp 88 | Sp 89 | Pred 89* | Advantage |
| GR 9 | 11.05 | 14.64 | 12.69 | 1.95 + | 10.71 | 14.35 | 12.17 | 2.18 + | 11.09 | 15.64 | 14.62 | 1.02 + |
| GR 10 | 15.61 | 16.27 | 15.86 | 0.41 + | 15.14 | 16.13 | 15.5 | 0.63 + | 15.03 | 17.14 | 16.14 | 1.00 + |
| GR 11 | 16.87 | 16.77 | 16.72 | 0.05 = | 16.76 | 16.99 | 16.75 | 0.24 = | 15.9 | 18.11 | 17.42 | 0.69 + |
| GR 12 | 17.43 | 17.27 | 16.91 | 0.35 = | 17.33 | 17.61 | 17.09 | 0.51 + | 16.92 | 18.39 | 17.74 | 0.65 + |

+ : GAINS EXCEEDING PREDICTED LEVELS = : GAINS AT PREDICTED LEVELS

* PREDICTED 1989 TEST SCORES BASED UPON STUDENTS DISTRICTWIDE WITH SIMILAR 1988 TEST SCORES AND CHARACTERISTICS (ROSE ANALYSIS). TEST OF ACHIEVEMENT AND PROFICIENCY AT GRADES 9-12. PRETEST (1988) FOR NINTH GRADERS IS IOWA TESTS OF BASIC SKILLS (ITBS).1988 TEST SCORES BASED ON 1985 NORMS.

## SCIENCE ACADEMY ATTRITION

Nearly all (91%) of the 360 students from grades 9 through 11 in 1987-88, returned to the Science Academy as sophomores, juniors, and seniors in 1988-89 (see Figure 17).

Figure 17
**RETURN RATE OF SCIENCE ACADEMY STUDENTS, 1987-88 TO 1988-89**

| 1987-88 GRADE | NUMBER OF STUDENTS | RETURNING NUMBER | PERCENT |
|---|---|---|---|
| 9 | 152 | 134 | 88% |
| 10 | 104 | 96 | 92% |
| 11 | 104 | 96 | 92% |
| TOTAL | 360 | 326 | 91% |

In the 1988-89 school year 28 students transferred out of the Science Academy. Of these 28 students two dropped out of school, 14 withdrew to another AISD school, four remained at LBJ, and eight moved out of AISD.

## IMPACT OF SCIENCE ACADEMY TRANSFERS

The Science Academy's total enrollment for 1988-89 was 514 students. The previous schools for these students are shown in Figure 18.

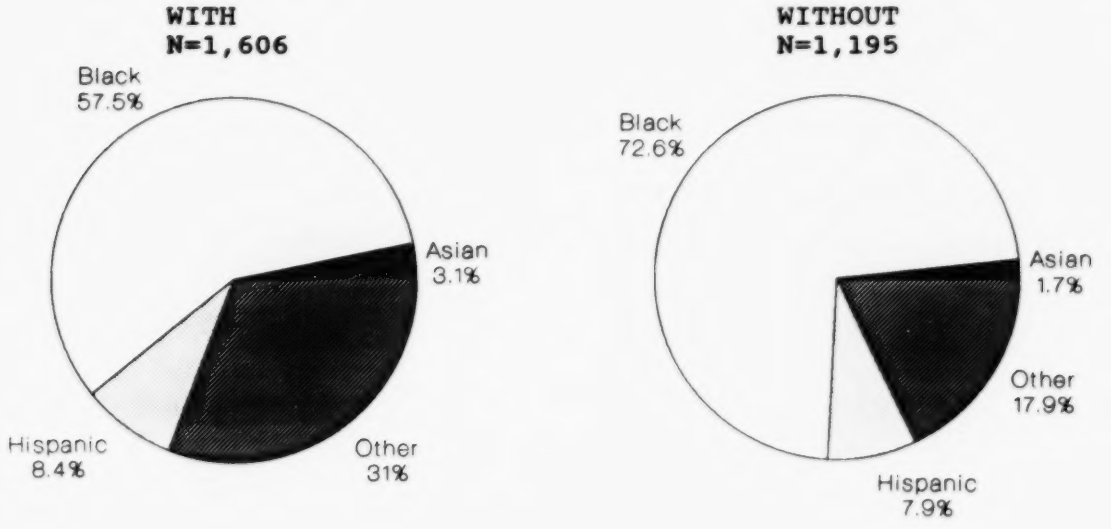
Figure 18
**PREVIOUS SCHOOLS FOR ALL 1988-89 SCIENCE ACADEMY STUDENTS**

| LOCATION | NUMBER | PERCENT |
|---|---|---|
| AISD | 459 | 89% |
| Austin Private | 30 | 6% |
| Texas, not Austin | 8 | 2% |
| Out of State | 11 | 2% |
| Out of U.S. | 6 | 1% |
| TOTAL | 514 | 100% |

## HOW HAVE SCIENCE ACADEMY TRANSFERS CHANGED LBJ'S ETHNIC COMPOSITION?

Science Academy transfers have had an effect on the enrollment of LBJ High School. The transfers have contributed to a more balanced composition of students. The percentage of Asian, Hispanic, and Other students are higher as a result of the Science Academy. The percentage of Black students is lower. The ethnic composition of LBJ with and without the Science Academy is shown in Figure 19. Only those students who transferred to LBJ to attend Science Academy (not those in LBJ's normal attendance area) were removed when considering the impact.

**Figure 19**
**ETHNIC COMPOSITION OF LBJ HIGH SCHOOL WITH AND WITHOUT THE SCIENCE ACADEMY 1988-89**



## "EFFECTIVE SCHOOL STANDARDS" AND THE SCIENCE ACADEMY

"Effective School Standards" have been developed for AISD elementary schools as a measure of school success. Secondary schools are currently assessing which standards would be appropriate for them. For purposes of this evaluation, elementary standards were applied to the Science Academy as information was available. Variables measured include:

- Student average attendance of 95% or greater;
- TEAMS mastery of 85% or greater;
- TAP median percentile of 50 of greater;
- TAP difference of seven percentiles or less
  -by sex
  -by income
  -by ethnicity; and
- Positive parental evaluation of 75%.

Data were not yet available on teacher absences at the time this report was due. **The Science Academy met all of the measurable "Effective School Standards" except a seven percentile or less difference by ethnicity on the TAP.** The standards are shown in Figure 20.

FIGURE 20
**EFFECTIVE SCHOOL STANDARDS FOR THE SCIENCE ACADEMY ALONE**

| DATA | | STANDARD | MET |
|---|---|---|---|
| 1. Student average percent of attendance | 96%* | 95% or greater | Yes |
| 2. TEAMS Percent Mastery | | 85% overall | Yes |
| Overall | 98% | | |
| Males | 96% | | |
| Females | 99% | Differences 7%iles or | |
| Low Income | 98% | less by sex, | Yes |
| Non-Low Income | 97% | income, and | Yes |
| Black | 97% | ethnicity | Yes |
| Hispanic | 100% | | |
| Other | 97% | | |
| 3. TAP median percentile of | | Percentile of 50% or greater | Yes |
| Males | 92 | | |
| Females | 87 | Differences 7%iles or | |
| Low Income | 87 | less by sex, | Yes |
| Non-Low Income | 90 | income, and | Yes |
| Black | 77 | ethnicity | No |
| Hispanic | 85 | | |
| Other | 93 | | |
| 4. Parent evaluation My child's school is an effective (excellent) school. | | 75% or more Agree or Strongly Agree | Yes |

| | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| N= | 2 | 7 | 0 | 0 | 0 |

* Fall, 1988 attendance

## OTHER MEASURES OF SUCCESS FOR SCIENCE ACADEMY SENIORS

### SAT MEANS

Mean scores on the verbal and the mathematical portions of the Scholastic Aptitude Test (SAT), as shown in Figure 21, were well above those of the District and the nation.

FIGURE 21
**SCIENCE ACADEMY MEAN VERBAL AND MATHEMATICAL SAT SCORES COMPARED TO SCORES FOR THE DISTRICT AND THE NATION**

| SAT Area | Science Academy | AISD | Nation |
|---|---|---|---|
| VERBAL | 510 | 442 | 428 |
| MATH | 590 | 489 | 476 |

### HONOR GRADUATES

Of 32 LBJ High School honor graduates, 23 were Science Academy students (see Figure 22). The Valedictorian and Salutatorian were also Science Academy students.

FIGURE 22
**SCIENCE ACADEMY HONOR GRADUATES COMPARED TO TOTAL HONOR GRADUATES OF LBJ**

| | Science Academy | Total LBJ |
|---|---|---|
| HIGHEST HONORS (TOP 2%) | 5 | 7 |
| HIGH HONORS (NEXT 3%) | 9 | 9 |
| HONORS (NEXT 5%) | 9 | 16 |

### SCHOLARSHIPS

Of the 97 Science Academy seniors, 50 were offered scholarships for a combined total of $1,129,519. The Science Academy produced three National Merit Scholars (see Figure 23). The Science Academy also had two National Hispanic Scholars. Thirty percent of AISD's National Merit Finalists were from the Science Academy. AISD had 51 National Merit Semifinalists and 44 finalists. This is three times the average number for a district the size of AISD.

FIGURE 23
**SCIENCE ACADEMY NATIONAL MERIT SCHOLARS COMPARED TO THOSE OF THE DISTRICT**

| | Science Academy | District |
|---|---|---|
| NATIONAL MERIT FINALISTS | 13 | 44 |
| NATIONAL MERIT SEMI-FINALISTS | 14 | 51 |

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COLLEGE ACCEPTANCES

Science Academy seniors have been accepted to colleges and universities such as Stanford, Yale, University of Chicago, Brown, Princeton, Rice, Notre Dame, University of Texas, Texas A&M, Air Force Academy, George Washington University, Carnegie-Mellon, UCLA, and others.

## REFERENCES

Austin Independent School District. (1988). Fall survey report. Austin, TX: Office of Student Records and Reports.

Austin Independent School District. (1988, October 14). Ethnic composition of students. Austin, TX: Office of Student Records and Reports.

Donovan, E. P., Fronk, R. H., & Horton, P. B. (1984, October). Eighth grade science teachers as sex-role models for eighth grade girls' science and engineering career interests. Paper presented at the meeting of the Northern Rocky Mountain Educational Research Association, Jackson, WY. (ERIC Document Reproduction Service No. ED 260 934)

Galindo, D. L., Baenen, N. (1989). Districtwide Survey Final Technical Report: 1988-89 (ORE Pub. No. 88.I). Austin, TX: Austin Independent School District, Office of Research and Evaluation.

Hopkins, P. (1989). Women, minorities, and the private sector in science and mathematics education: A review of the literature (ORE Pub. No. 88.29). Austin, TX: Austin Independent School District, Office of Research and Evaluation.

Halverson, W., Norris, W., Smith, J., & Waters, H. (1988, June). Elementary/Secondary science curriculum collaboration: Second and third grade science activities. Austin, TX: Austin Independent School District, the Science Academy.

Mangino, E., Rodgers, N., Meyer, A., & Rumbaut, M. (1988). Achievement profiles, 1987-88. Vol. I (ORE Pub. No. 87.54). Austin, TX: Austin Independent School District, Office of Research and Evaluation.

Walsh, M. (1988, September 28). Interest in teaching on the rise. Education Week, 8(4), 23.

# Austin Independent School District


**Department of Management Information**

Dr. Glynn Ligon, Executive Director

**Office of Research and Evaluation**
**Systemwide Evaluation**

Nancy R. Baenen, Evaluator

**Author:**

Patricia Hopkins, Evaluation Associate
Nancy R. Baenen, Evaluator
Roxanne Smyer, Evaluation Associate
Vicente Paredes, Evaluation Associate

**Contributing Staff:**

Stacy Buffington, Programmer/Analyst
Ruth Fairchild, Secretary

**Board of Trustees**

Ed Small, President

John Lay, Vice President

Bernice Hart, Secretary

Nan Clayton

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Dr. Beatriz de la Garza

Dr. Gary R. McKenzie

**Superintendent of Schools**

Dr. John Ellis



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